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CBRN Standards Development



CBRN Standards Development

- CBRN Escape Respirator Concept Goal:

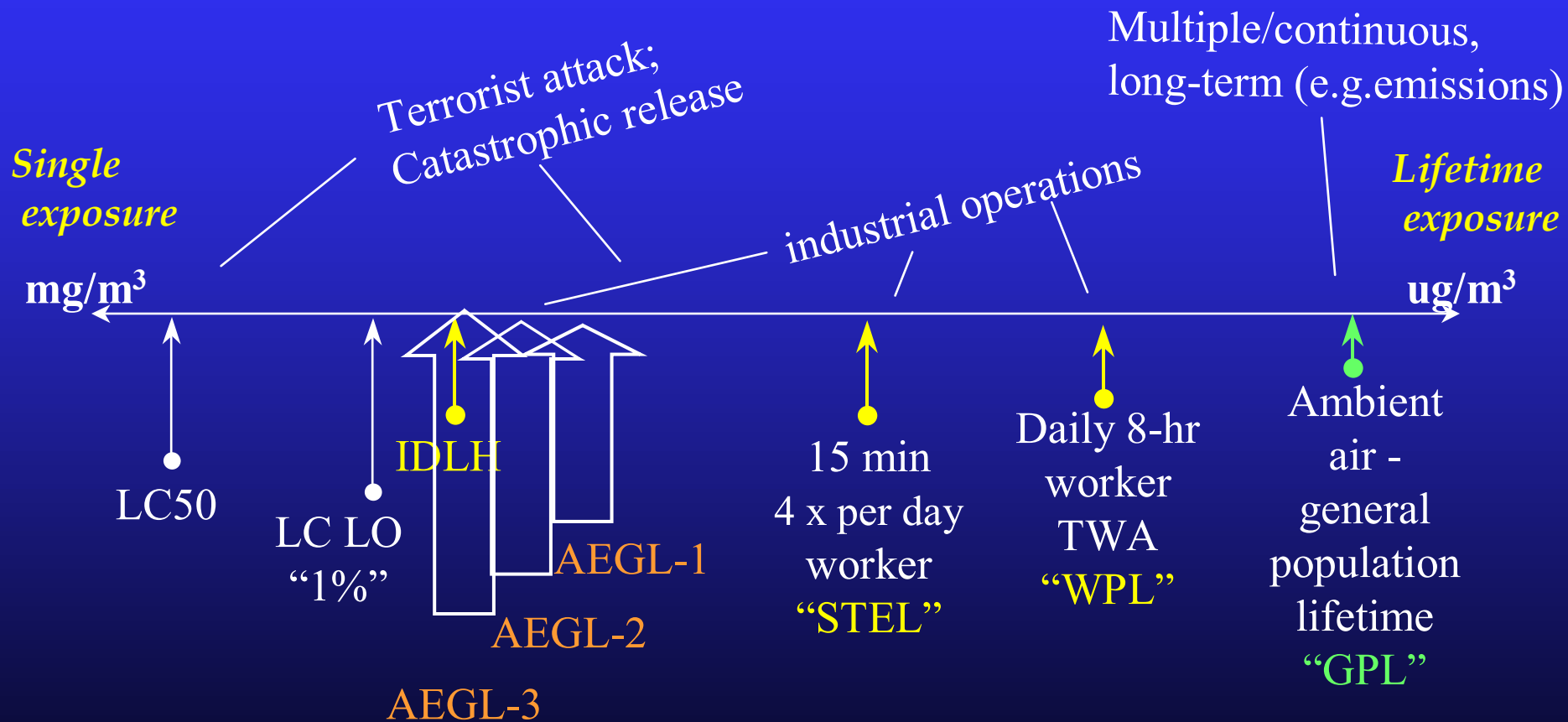
Develop a NIOSH standard for **escape only air-purifying** respirators that addresses **CBRN** materials identified as **inhalation hazards** from possible terrorist events **for use** by the **general working population**.



CBRN Standards Development

- CBRN Escape Respirator
 - Hazard Analysis – Complex Problem
 - Intended Escape from Where and What
 - Hot Zone – High Concentrations
 - Warm Zone – Low Concentrations
 - Wide Variation in Threat

Chemical Air Exposure Levels Continuum*



*not to scale for any specific chemical— general representation



CBRN Standards Development

- CBRN Escape Respirator
- Three Categories of Protection

Category	Hazard Description	Respirator Type
HIGH (Hot & Warm Zones)	CWA & TIM Hazard Threats at High Concentrations and/or Oxygen Deficiency	Self Contained Escape Respirator
SPECIFIC (Hot & Warm Zones)	CWA + Specific TIM Hazard Threats at High Concentrations	Specific Gas/Vapor + CWA Air Purifying Escape Respirator
LOW (Warm Zone)	CWA & Multiple Hazard Threats at Low Concentrations	Multi Gas/Vapor/Particulate Air Purifying Escape Respirator



CBRN Standards Development

- CBRN Escape Respirator – Hazard Challenge
 - HIGH Category:
 - Unknown Hazards
 - Expected High Concentrations
 - Universal Solution for Escape Protection



CBRN Standards Development

- LOW Category:
 - Multi Gas Protection (CBRN APR)
 - Test Concentrations 3 X IDLH
 - Escape From 2 X IDLH



CBRN Standards Development

- Multi Gas/Vapor/Particulate Escape Respirators for use at low hazard threat conditions shall meet the gas/vapor challenge as indicted below. Escape Respirators intended for use at low hazard threat conditions with carbon monoxide protection shall meet the requirements identified below, as well as requirements TBD for Carbon Monoxide.

	Test Concentration (ppm) Draft	Breakthrough Conc.(ppm) Draft
Ammonia	2500	TBD
Cyanogen Chloride	300	TBD
Cyclohexane	3900	TBD
Formaldehyde	500	TBD
Hydrogen Cyanide	940	TBD
Hydrogen Sulfide	1000	TBD
Nitrogen Dioxide	200	TBD
Phosgene	250	TBD
Phosphine	300	TBD
Sulfur Dioxide	1500	TBD



CBRN Standards Development

- CBRN Escape Respirator
 - SPECIFIC Category:
 - Multi Hazard Protection - Limited
 - CWA Capability
 - Specific TIM's from APR Hazards



CBRN Standards Development

- Escape respirators intended for use at the specific hazard threat category conditions shall meet the gas/vapor/particulate testing at identified conditions. Additional Specific test agent protections can be added to the minimum as specified by the applicant for Ammonia, Formaldehyde, Nitrogen Dioxide, Hydrogen Cyanide, Sulfur Dioxide, Phosphine, and Carbon monoxide. Minimum test agents are as follows:

	Test Concentration (ppm) Draft	Breakthrough Concentration(ppm) Draft
Cyclohexane	Section 2(d)1	TBD
Phosgene	Section 2(d)1	TBD
Hydrogen Cyanide	Section 2(d)1	TBD
Cyanogen Chloride	Section 2(d)1	TBD



CBRN Standards Development

- Test Challenge Concept
 - 1.5 X Design Escape Use
 - Example:
 - Escape From 5 X IDLH Concentrations
 - Test at 7.5 X IDLH



CBRN Standards Development

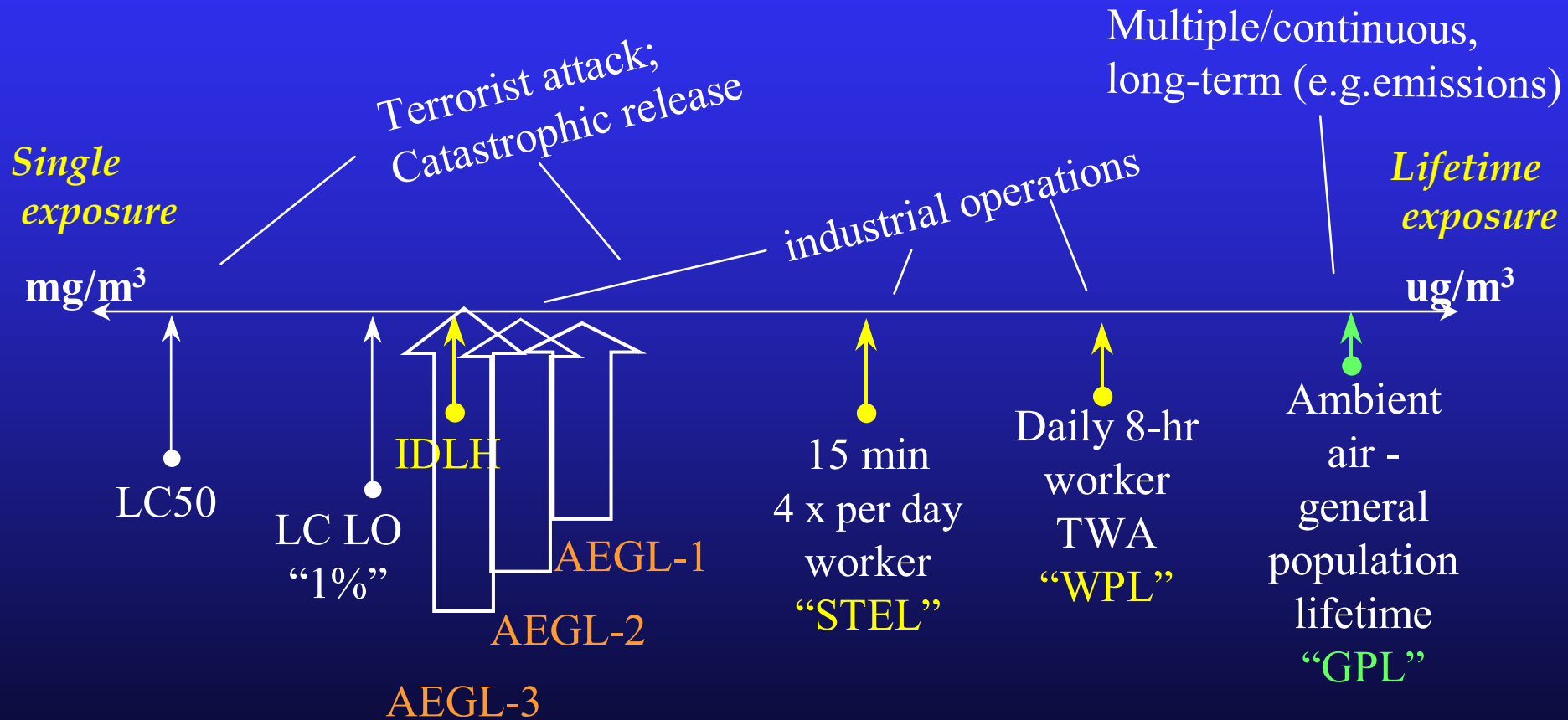
- CBRN Escape Respirator
 - Rated Duration (Escape Time)
 - 15 or 30 Minutes
 - High Physiologic Demand
 - 100 liters per minute ventilation
 - 5 minutes duration



CBRN Standards Development

- CBRN Escape Respirator
 - Test Breakthrough Requirements
 - Mild Effects Levels
 - Acute Exposure Guidelines Level (AEGL)
 - Emergency Response Planning Guidelines (ERPG)

Chemical Air Exposure Levels Continuum*



*not to scale for any specific chemical— general representation



CBRN Standards Development

- CBRN Escape Respirator - LAT
 - LOW Category - Live Agent Testing
 - CBRN APR Test Parameters
 - Challenge Concentrations
 - GB @ 210 mg/m³
 - HD @ 300 mg/m³ + 0.46 ml liquid



CBRN Standards Development

- CBRN Escape Respirator - LAT
- SPECIFIC Category – Live Agent Test
- HD Tested at MCE – 300 mg/m³
- Variable Scale For GB
 - GB @ 1.5 X Designed Escape Use
 - Example: Design Use 500 mg/m³
Test @ 1.5 X 500 = 750 mg/m³



CBRN Standards Development

- CBRN Escape Respirator
- SPECIFIC Category – Live Agent Test
 - Breakthrough Parameters
 - GB: .087 mg/m³ peak, 2.1 mg-min/m³ Ct
 - HD: 0.60 mg/m³ peak, 6.0 mg-min/m³ Ct
- Test Time
 - Challenge for 15 or 30 minutes
 - Monitor for 30 or 60 minutes



CBRN Standards Development

- CBRN Escape Respirator
- LOW Category
 - Breakthrough Parameters
 - GB: .087 mg/m³ peak, 2.1 mg-min/m³ Ct
 - HD: 0.60 mg/m³ peak, 6.0 mg-min/m³ Ct
- Test Time
 - Challenge for 15 or 30 minutes
 - Monitor for 30 or 60 minutes



CBRN Standards Development

- CBRN Escape Respirator
- CO₂ Dead Space
 - Proposed Test With ABMS
 - Simulate Worst Case Sedentary Conditions, Low Ventilation
 - 10.5 lpm, 2.5% max. CO₂



CBRN Standards Development

- CBRN Escape Respirator
- Laboratory Respiratory Protection Level
 - Measured Protection Level 2000
- Anthropometric Sized Panel
 - LANL Panel
 - ANSI / ISEA Draft RPED Standard
 - Head Size Panel



CBRN Standards Development

- CBRN Escape Respirator
- Donning Time:
 - 30 Seconds
 - From Ready-To-Use Configuration
 - Ready-To-Use = Operational Package Prior to Use



CBRN Standards Development

- CBRN Escape Respirator
- Field of View
 - IAW EN 136 & ANSI/ISEA RPED Draft
 - Not Less Than 70% Natural Field of Vision
- Breathing Resistance
 - 85 liters per minute
 - Inhalation: 70 H₂O mm maximum
 - Exhalation: 20 H₂O mm maximum



CBRN Standards Development

- CBRN Escape Respirator
- Fogging

Method: Human wear trials

Conditions:

- ◆ Cold: minus 21 °C (- 6 °F)
- ◆ Cool & humid: 15.5 °C (60 °F) at 75% RH

No. of Test Participants: 2 per test condition

Procedure:

- ◆ Baseline visual acuity (Snellen eye charts or equivalent)
- ◆ 4 hour respirator environmental conditioning.
- ◆ Respirator donning followed by test of visual acuity.
- ◆ 5 min walk (4.8 km/hr (3 mph)): 2 min rest: 5 min walk: rest
- ◆ Measure visual acuity during rest periods.



CBRN Standards Development: Environmental Conditioning

Purpose of Tests: Perform environmental storage, transportation shock and drop tests on the CBRN Air-Purifying Escape Respirator to qualify durability and to detect any initial life cycle failures modes that may occur from typical use.

Goal: To ensure the CBRN Air-Purifying Escape Respirator provides adequate respiratory protection after being subjected to normal transportation, storage and rough handling conditions by the user

Environmental, Transportation and Rough Handling Durability Test Matrix

Test	Test Method	Test Conditions	Duration
Hot Diurnal	Mil-Std-810F 501.4	(35 °C/ 95 °F) to (71 °C/ 160 °F), 24 Hour cycle	3 Weeks
Cold Constant	Mil-Std-810F 502.4	Basic Cold, -32 °C (-24 °F), Constant	3 Days
Humidity	Mil-Std-810E 507.3	Realistic, Natural Cycle Humidity Profiles in the U.S. Mil-Std-810E; Table 507.3-II	5 Days "quick look"
Transportation Vibration	Mil-Std-810F 514.5	U. S. Roadway Vibration, Unrestrained: 12 Hours/axis 3 Axes: Longitudinal Axis, Vertical Axis and Transverse Axis.	Total duration: 36 hours = 12,000 miles
Drop Test: As Received Condition	Height of 3 feet	Unpackaged filter, 1 drop/filter on one of the 3 Axis: Major Axis Vertical, Air Outlet Port; Major Axis Horizontal; and Major Axis Vertical, Air Inlet Port.	After drops



CBRN Standards Development

- CBRN Escape Respirator
 - Weight: TBD
 - Communications: TBD
 - Materials Integrity:TBD
(Flame/Heat/Permeation)
 - Dermal Protection: TBD
 - Service and Maintenance: TBD
 - Training: TBD



CBRN Standards Development

- CBRN Escape Respirator
- Program Milestones CBRN-Escape
 - Concept Definition Escape Respirator August 30, 2002
 - Public Meeting October 30, 2002
 - Escape (APR) Detailed Std. Draft January 15, 2003
 - Peer Reviews January 31, 2003
 - Standard Release March 31, 2003
 - Implementation of Certification July 31, 2003



CBRN Standards Development

- Open Comment Period



Administrative Details

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